

**A LOW-COST HIGH-SPEED MULTIPLIER/ACCUMULATOR
UNIT FOR DECISION FEEDBACK EQUALIZERS**

ABSTRACT OF THE DISCLOSURE

5 A multiplier device for multiplying one of a discrete set of digital level values with a filter
coefficient in a filter device implemented in a decision feedback equalizer comprises: a
decoder device for receiving a discrete digital level value to be multiplied and generating
control signals according to the digital level value; an inverter circuit providing two parallel
operations, each operation including multiplying the determined number by either +1/-1 in
10 accordance with the control signals for generating two intermediate results; a multiplier
circuit receiving the two intermediate results and providing respective parallel operations for
multiplying a corresponding intermediate result by +1 or zero (0) in accordance with a control
signal and generating further intermediate results; a logic circuit for shifting bits of one
15 further intermediate result to effect a multiplication of one of the further intermediate output
result with a discrete digital level value different than any of the original plurality of discrete
digital level values; and, an accumulator device for adding the results of the logic circuit shift
multiplication with the further intermediate output result to obtain a final multiplication result.
The multiplier device is implemented for performing convolution operations is the filter and
generating filter outputs implemented for reducing inter-symbol-interference in a
20 communication system. The multiplier device advantageously achieves the desired
multiplications for convolution operations using less semiconductor real estate, and at a
greater speed and less redundancy.